24. *Jungermannia multifida*, L. On moist rocks among mosses; fructifying in several places.

25. — *nemorosa*, L. In a great variety of situations.
Var. *β. purpurascens*, in Hell Cleft.
Var. *γ. recurvifolia*, on rocks near streams.

26. — *pinguis*, L. In bogs and near streams.

27. — *platyphylla*, L. Rocks.

28. — *polyanthos*, L. On stones in the bed of the Balder.

29. — *pubescens*, Schrank. Frequent on rocks (chiefly limestone) near the Tees and its tributaries. I found *perigonia* in abundance, but no *calyces*, though I searched most minutely.

30. — *reptans*, L. Cronkley Scarr; very sparingly.

31. — *riparia*, Tayl. MSS. Sides of streams; not common.

32. — *scalaris*, Schrad. Frequent in moist situations.

33. — *serpyllifolia*, Dicks. Near the High Force, Hell Cleft and other places, yet nowhere abundant.

34. — *setacea*, Web. Heathy situations near Maize beck and Cronkley Scarr.

35. — *spinulosa*, Dicks. Near the High Force and Caldron Snout, but rather rare.

36. — *Tamarisci*, L. On rocks and about the roots of trees.

37. — *Taylori*, Hook. Cronkley Scarr and the west side of Mickle Fell.

38. — *Trichomanis*, Dicks. Frequent.

39. — *trichophylla*, L. Abundant in moist situations.

40. — *undulata*, L. Maize beck. Dr. Taylor's opinion that this is only a variety of *J. nemorosa* ('Flora Hibernica,' part ii. p. 61) is, I fear, too well founded.

41. *Marchantia androgyna*, L. Exceedingly abundant on rocks by the Tees, Ettersgill beck, and other streams.

Collegiate School, York, Nov. 15, 1843.

XXXVI.—*On the Fossil Vegetables of the Sandstone of Ayrshire.* By J. Shedden Patrick, F.R.S.E., F.R.SS.A. &c.*

[With a Plate.]

Having observed, in visiting the Museum of the Royal Society, that, although it contained many fossils of interest, especially a very beautiful and complete series from England, presented by the Earl of Cathcart, those of Ayrshire appeared to be altogether wanting, I was induced to take advantage of a few months' residence in the district of Cuninghame in that county, during the summer of 1843, to make a small collection of some of the principal fossils of the locality for the purpose of presentation to the Society's museum.

The fossil vegetables which constitute the collection were obtained from a quarry in the parish of Stevenston, where I was principally residing. The quarry, which is on the estate of Mr. Warner of Ardeer, belongs to the carboniferous group, and is considered the most valuable for white sandstone in the west of Scotland. It is thus spoken of in the 'New Statistical Account' (p. 437) :—

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* Read before the Royal Society of Edinburgh, Jan. 2nd, 1844.

"This is the most valuable quarry of white freestone in the west of Scotland. The produce of it has long been well known to the public under the name of 'Stevenston stone.' It is of very excellent quality; the colour is good, and being firm and fine in the grain and easily wrought, it takes a fine polish and stands well. It is much used at home, and it is still more in request in Dublin and Belfast and other places in Ireland, for it can be sawn like marble, with which it vies in beauty; and it can be formed into slabs of any size required. At home and also in Ireland, it is used in the interior of houses for stairs, the pavement of lobbies and halls, and for chimney-pieces, &c.; and externally it is employed in public and private buildings for fronts, chimneys, columns, &c. Columns can be furnished of any dimensions from 10 to 20 feet and upwards in altitude. It is used for tombstones, gate-posts, &c. The quarry lies from S.W. to N.E., and the dip is to the S.W., the same as the coal strata, between the first and second of which it is found. It is in irregular layers or posts, varying from 6 inches to 6 feet in thickness. It requires to be bared, where it is at present wrought, of about 25 feet of different kinds of soil; viz. of about 4 feet of sand, 3 feet of loam, and the rest, down to the rock, till or slate-clay. The stone passes from the quarry to Saltcoats and Ardrossan by railway, and is there shipped," &c.

The coal has been wrought out from beneath it within the remembrance of the present generation. The sandstone has been quarried to the depth of above 20 feet, and it goes about 20 feet deeper. In the 'New Statistical Account,' in a note at the foot of page 429, the Rev. author, after mentioning that there have been about seventy specimens of subfossil shells found in the coal-field, and naming twelve kinds not now found in a recent state on the shore, goes on to say, "We have had the pleasure of picking up abundance of these shells where they are boring the rock at Ardeer or Stevenston quarry. There the shells are only 5 feet under the green sward. At this depth there is a bed of coarse sea-sand, mixed with *Turbo littoreus*, &c. &c., the whelks and limpets and cockles being sound and entire. Under this bed of gravel and sand and shells there is a stratum of solid till or slate-clay 10 or 12 feet thick, overlying the beautiful sandstone of the quarry. This schistus is perforated in innumerable places to the depth of 5 or 6 inches by *Pholas crispata* or the Borer, in the same manner as the progeny probably of these venerable Borers are, at the present day, piercing the same rock in the sea at Saltcoats. The bore is fully an inch in diameter. The shell still occupies the mouth of the perforation; and, though now frail, it is distinctly marked by its waved ridges and longitudinal furrows, and the groove running from the hinge to the margin. But what is much more wonderful, at the bottom of the holes which the *Pholas* has bored, there is a matted tuft of sea-weed (*Ulva intestinalis*) not petrified,—not converted into peat,—not rotten,—but retaining its sap and form, and texture and reticulations, and even its pale-green colour! This is not a little surprising. Sir Wm. Hooker, to whom we sent specimens, says that it could not have grown 5 feet under ground. From the shells then and from the *Ulva*, the sea must have been there, though at a period too remote to be now ascertained; and although the sea is now about three-quarters of a mile distant from the quarry, we can easily credit the tradition that, in ancient times, vessels were accustomed to lie at anchor north of the quarry, and about the place where Ardeer-house now stands (fully a mile from the present high-water mark). Indeed, from various phænomena that have come under our observation, we have the most thorough conviction that at a period not extremely remote, the half of this parish (Stevenston) was overflowed by the sea."

Under the sandstone strata there is a stratum of shale about 18 feet in thickness, then comes a coal called "the five-quarter coal," then another stratum of shale, and under it the parrot-coal. The quarry has been worked for upwards of sixty years, and is therefore of considerable extent. The strata very much vary in thickness at different parts of it.

The fossils are not confined to any one stratum of the sandstone, but are found in them all, wherever the sandstone is faulty. I have counted about five strata at the deepest part of the quarry, separated from each other by thin layers of shale, and fossils are found in all these strata, chiefly however where the sandstone is rendered impure by a mixture of greenstone and ironstone. There have been above thirty different kinds of fossils found in this quarry and in the schist connected with the coal: among them many beautiful impressions of ferns, reeds, *Stigmariæ*, *Sigillariæ*, *Lepidodendra*, and other plants unknown in the present day. Some of these were discovered 70 fathoms (420 feet) beneath the surface of the earth. Among the ferns will be found *Sphenopteris*, *Neuropteris*, *Pecopteris*, &c. The fossils which occur in greatest profusion are the *Calamites*, which are thus spoken of by Mr. Gourlay at a meeting of the Philosophical Society of Glasgow, on 15th February 1843:—(See their Transactions, p. 107.)

"The fossil plants referable to the genus *Calamites* of Brongniart and other authors occur profusely in our coal-fields as well as in those of the North of England. They are found in a state of compression, which renders it difficult to determine their species, or to form an idea of their probable affinity to plants of the present day. Judging from the remarkable compression of even the largest specimens, it is likely that the Calamite had a hollow jointed stem, with transverse phragmata, resembling that of the bamboo cane, and, at least in some species, with verticillate branches, which again have verticillate leaves. Brongniart thinks that the *Calamites* must have had a close affinity to the recent genus *Equisetum*, from their striated, or rather furrowed, jointed stems, and the presence in one of his specimens of what he takes to be a sheath; but the objection to this view is, that they appear to have had both wood and bark, and consequently, with the habit of a Monocotyledonous plant, they come nearer the Dicotyledones in structure. A specimen from the Duke of Hamilton, in the Glasgow Geological Museum, was found in the sandstone in an upright position, and shows the form of the stem without the usual compression; but it is apprehended, that even were it possible to form a thin polished section, it would exhibit no trace of structure."

They are also admirably described in Lindley and Hutton's 'Fossil Flora,' vol. i. p. 49. Among the several varieties which I possess, the *Calamites nodosus* is very common. The *Calam. approximatus* is also found frequently. The *Calam. cannæformis* is rarer: I regret that my specimens of it are poor. The following are also seldom to be met with here, although I have been able to obtain distinct specimens of them all, viz. *Calam. arenaceus*, *C. Mougeotii* and *C. verticillatus*.

The *Sternbergia approximata* is considered rare, and the specimens procured of it are in general small. Lindley calls it "a most singular coal-measure plant occurring in most coal-fields of this country, but not abundant anywhere. The specimens are usually found in sandstone, and are covered with a fine coal, which adheres either in the form of an even, thick, glossy integument, or in a powdery state to the surface of the stem." The Rev. David Landsborough, late minister of the parish of Stevenston, says, in a letter I had the pleasure of receiving from him a short time ago, "I picked from the middle stratum a fine large specimen of *Sternbergia approximata*," which shows that such are occasionally to be met with in that quarry. *I* have not, I regret to say, been so fortunate as to get any "fine large specimen," but have one or two very distinct ones; two with the coal still adhering, which is very difficult to obtain, as it is so extremely friable.

I had a very fine specimen of *Sternbergia nodosa* of a length which has seldom been got out of the quarry entire, but it has most unfortunately been broken in its journey to Edinburgh.

While hunting among the *débris* of the quarry I was fortunate enough to discover a curious fossil, which I have every reason to believe is original; it bears a considerable resemblance to a piece of tartan, being divided into regular parallelograms by double lines intersecting each other at right angles (Pl. V. fig. 1.). On submitting it in September last to the inspection of Mr. Landsborough and other gentlemen in the neighbourhood, they all declared that it was new to them. I also showed it to the manager of the works and to several of the most intelligent of the overseers and colliers (most of whom had been born in the village, and passed the greater part of their lives in the works), and they all said they had not before met with it. I may therefore, I think, consider it unique. Mr. Landsborough, to whom it has since been sent for more minute inspection, writes thus: "I think, after attentive consideration, I have got an excellent name for your beautiful fossil, *Dictyodendron Patricii*; deriving the generic appellation from *δίκτυον, a net*—how like it is to network!—and *δένδρον, a tree* (we have *Dictyosiphon* (*δίκτυον-σίφων*) in recent botany for the same reason), and dedicating it by the specific name to yourself as the discoverer."

We now come to that class of fossils which is peculiar to, and the distinguishing feature of, the coal-measures, the *Stigmariæ*. Of these the *Stigmaria ficoides* is the principal. Three varieties will be found in the collection. The most curious of these is *Stigmaria radiata*: this species consisted of a central stem or shoot, which is said, at times, to have attained the height of 20 to 30 feet, and from which branches radiated in every direction, arching over and bending downward. At the time the British Association was at Glasgow, a specimen of this stem was exhibited between 4 and 5 feet in length, and which is now deposited in the Geological Museum of that city. Brongniart, in his 'Histoire des Végétaux Fossiles,' comes to the conclusion that "the *Stigmariæ* and *Sigillariæ* constitute a peculiar and extinct family (belonging probably to the Gymnospermous division of the Dicotyledons), but of which neither the fruit nor the leaves are as yet known. These fossils, it is evident, are nearly related to each other; and *Anabathra* ought likewise to form a part of the same group. Perhaps *Stigmaria* is only the root of *Sigillaria*." It is unnecessary to quote the passage further. *Stigmaria nodosa* is likewise met with in the quarry.

The *Trigonocarpum olivæforme* (or fruit of the palm-tree) is very scarce, being found only in one part of the quarry of very limited extent—in the lowest stratum next to the shale. I possess two or three specimens, one of which is in the matrix.

Another fossil very rare, in that district at least, is the *Halonia tuberculata,* of which a very fine specimen was obtained several years ago by Mr. Landsborough, adhering to the surface of the upper stratum of sandstone. A specimen was sent to me lately, purporting to be this species of the *Halonia,* but as I am dubious of the correctness of this assertion, I shall not notice it on the present occasion.

We next come to the *Lepidodendra,* of which Mr. Gourlay says, "This genus of fossil plants is one of great interest, not only on account of its abundance and the elegance and beauty of its impressions and casts, but from the affinity between the fossil *Lepidodendron* and two existing genera of plants. In the first volume of the 'Fossil Flora,' by Dr. Lindley and Mr. Hutton, the authors express their belief that the *Lepidodendra* would be found to be intermediate between the *Coniferæ* and *Lycopodiaceæ* of the present day. The first of these natural orders, the *Coniferæ,* comprehends the pines, larch, cedar, &c. The *Lycopodiaceæ,* on the other hand, are small in size compared with either the *Lepidodendra* or the *Coniferæ,* and a few species are indigenous to this country, where they are familiarly known as club-mosses. The opinion referred to has been confirmed by subsequent investigations. Some of the specimens of this genus, contributed to the Glasgow Geological Museum, are of singular beauty; and in particular some specimens of *Lep. elegans* from C. J. Baird, Esq. of Shotts Iron-work." I have three species of this fossil, *Lepidodendron Sternbergii, Lep. Harcourtii,* and a very curious and peculiar variety which is also rare, although Mr. Landsborough informs me he has a fine large specimen of it. Of this variety I am unable to give the proper specific name. (See Plate V. fig. 2.)

Endogenites striata is occasionally met with. I have one specimen.

The last of the *Coniferæ* which I shall mention at present is one which, as far as I am aware, is unique. It was discovered in 1842 by Mr. Landsborough. Most of the members of this Society are aware that, previous to the meeting of the British Association in Glasgow in Sept. 1840, a committee was appointed to make a collection of the minerals, rocks and organic remains of the west of Scotland; through their exertions, and with the zealous co-operation of many noblemen and gentlemen of the surrounding districts, particularly in the mining departments, a very extensive and beautiful collection was got together, which now forms, with the additions since that period, the Geological Museum of Glasgow. To this Mr. Landsborough presented many valuable contributions.

With regard to the fossil under consideration, Mr. Landsborough, not being able to class it with any known species, submitted it to the inspection of the Geological Society of Glasgow, to whom it was exhibited by Mr. Gourlay on February 15, 1843, who thus reports upon it: "A most remarkable cast of a plant was lately sent me by the Rev. David Landsborough, which was found in a quarry of carboniferous sandstone at Stevenston, Ayrshire. The specimen, when found, had a coating of coal which the quarryman unfortunately picked off with his knife, but the exposed surface presents a very singular appearance, and is unlike any fossil plant which we have ever seen figured. Its peculiar feature, which is at once apparent on inspection, is its resemblance to part of a common osier-basket (Pl. V. fig. 3.): hence Mr. Landsborough has for some time been in the habit of humorously distinguishing it as 'Noah's creel' for want of a better appellation. To supply this desideratum in nomenclature, and as no such fossil appears to have been described or figured, I have ventured to name it *Lyginodendron Landsburgii,* forming the generic name from λύγινος, *wicker-work,* and δένδρον, *a tree,* and dedicating it by the specific name to my friend Mr. Landsborough, a gentleman distinguished not only as a pious and conscientious clergyman, but as an enthusiastic and most successful cultivator of natural history; one, too, whose warm-hearted and amiable disposition endears him to all who have the pleasure of his acquaintance. The fragments of the fossil were spread over a space of about two yards, the finest specimen found being about 18 inches in length by 3 in breadth, and have not been observed except in that place." He then goes on to mention some of the other productions of the same quarry, in which a great many fossil fruits occur, which are obviously those of a palm (*Trigonocarpum olivæforme*); and also specimens of the *Sternbergia approximata,* "a singular and rare coal-plant," a fine specimen of which has been deposited in the museum of the "Andersonian Institution" by Mr. J. Craig. I am happy to say I have obtained one or two specimens of this curious and rare fossil (the *Lyginodendron Landsburgii*), which will be found in the collection. Mr. Landsborough mentions that only a very few specimens exist, and, as he believes, it has not been found elsewhere: he discovered it in the middle stratum.

I may dismiss the other fossils I have to exhibit to you in a very few words. The principal ones are the *Sigillariæ,* which are thus described by Mr. Gourlay:—"The genus *Sigillaria* is so named from *sigillum,* a seal, on account of the peculiar impressions on the stems. Less is known of this genus than even the *Calamites,* and similar forms are quite unknown in the vegetation of the present day. They are found inclined in all directions, sometimes passing vertically through beds of sandstone, but most frequently in a horizontal position; and then they are crushed so extremely thin that they seem to have been hollow like the Calamite, and to have possessed very little substance, although attaining a height of 40 or 50 feet. The compressed stems have been found as much as 5 feet in breadth. They are fluted longitudinally in general, and marked at regular intervals with single or double scars, evidently produced by leaves which have been articulated to the stem. These marks are different in the decorticated state of the fossil from those which appear on the surface of the coaly envelope representing the bark. [This is well seen in the *Sigillaria reniformis*.] M. Brongniart considers these to be the remains of the stems of arborescent ferns, but Lindley and Hutton have established that the fluted *Sigillariæ* have nothing analogous to tree-ferns. On the contrary, they appear to have been plants with hollow cylindrical stems, consisting of wood and bark and clothed with leaves, attaining a height of 40 to 60 feet, but belonging to a family with no representative, or even relation, in the 'Flora' of our day." I have two varieties of the *Sigillaria*: *Sigil. reniformis*, two of the fragments of which must have belonged to very large individuals of the species, and *Sigil. oculata*.

I may remark that there is a very able and interesting article in the January Number of the 'Edinburgh New Philosophical Journal,' edited by Prof. Jameson, "On the general character of the Fossil Plants of the genus *Sigillaria*," from the pen of Wm. King, Esq., Curator of the Museum of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, from which, however, my limits will not allow me at present to quote.

Mr. Landsborough says, "The most magnificent fossil found in the quarry is *Bothrodendron punctatum*. Only two specimens have been found, of which I possess one." He would have permitted me to exhibit it to the Royal Society, but he adds, "since leaving the Manse my minerals have got into sad confusion, and amid the press of business I have not been able to arrange them, or lay my hands upon it, although it is a specimen I could with difficulty lift from the ground." *I* have not been able to obtain a good specimen of this remarkable fossil, but have been fortunate enough to find, among the débris of the quarry, a very distinct impression or cover of one.

Another very curious and remarkable fossil is the *Stylolithon*, of which there appears to be two distinct varieties; one with very broad stripes, the other with the lines more closely approximating to each other, but more deeply indented.

Another peculiar fossil was discovered lately by Mr. Landsborough, and has been named by him *Batodendron*, from *βάτος, a bramble*, and *δένδρον, a tree*, from the exact resemblance it bears to a knotted bramble. He writes me that he has never been able to meet with either any figure or description of it. He presented one specimen of it to Professor Jameson of Edinburgh.

Had the excavators of the quarry proceeded with any care, branches of trees of considerable size might have been got out uninjured; but workmen are proverbially careless and indifferent, and few of any length have been saved. My friend Mr. Warner of Ardeer, proprietor of the quarry, had one or two of considerable magnitude, both as regarded length and girth.

I have now brought to a close my remarks on the fossil vegetables; but I have still one specimen to notice of an altogether different kind.

On the estate of Ardeer, to which I have already alluded, there is a chain of coal-pits extending from W.N.W. to E.S.E. for a distance of between four and five miles. In these the dip of the strata is to the S., and consequently the rise to the N., which dip and rise decline on an average from the horizon about 1· in 7·5. In sinking the shafts for these, the miners have, in every instance, had occasion to pass through a stratum or bed of fresh-water shells about 9 inches in thickness and of extreme hardness. The matrix, in which the shells are imbedded very thickly, is an impure ironstone. In speaking of this, in the 'Statistical Account,' Mr. Landsborough calls it marble; but he had fallen into the error from having been told that a chimney-piece had been made of it, and, on seeing the fossil, at once discovered it, though too late, as the book was by that time published.

The pit from whence I obtained the masses submitted for inspection is the north-westernmost of the range (or "Turf-Dyke-pit"), and the deepest, 84 fathoms (= 504 feet). The shell-bed in it was struck at 37 feet from the surface, while in the south-easternmost (or "No. 7 pit"), now in the progress of shanking, the miners penetrated to the depth of 15 fathoms (= 90 feet) before they came upon the shell stratum, which lies immediately above the "main coal."

The shells of which the mass is chiefly composed, Mr. Landsborough was at first inclined to consider as the *Unio Pictorum* of Lamarck; but on submitting them to Dr. Fleming of Aberdeen, that celebrated naturalist pronounced them to be the *Unio Urii*, in which opinion Mr. Landsborough on further examination concurred.